DICHOTOMY IN THE DESIGN STUDIO: ADAPTING TO NEW BLENDED LEARNING ENVIRONMENTS

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Abstract

In a study aimed at better understanding how staff and students adapt to new blended studio learning environments (BSLE's), a group of 165 second year architecture students at a large school of architecture in Australia were separated into two different design studio learning environments. 70% of students were allocated to a traditional studio design learning environment (TSLE) and 30% to a new, high technology embedded, prototype digital learning laboratory. The digital learning laboratory was purpose designed for the case-study users, adapted Student-Centred Active Learning Environment for Undergraduate Programs (SCALE-UP) principles, and built as part of a larger university research project. The architecture students attended the same lectures, followed the same studio curriculum and completed the same pieces of assessment; the only major differences were the teaching staff and physical environment within which the studios were conducted.

At the end of the semester, the staff and students were asked to complete a questionnaire about their experiences and preferences within the two respective learning environments. Following this, participants were invited to participate in focus groups, where a synergistic approach was effected. Using a dual method qualitative approach, the questionnaire and survey data were coded and extrapolated using both thematic analysis and grounded theory methodology. The results from these two different approaches were compared, contrasted and finally merged, to reveal six distinct emerging themes, which were instrumental in offering resistance or influencing adaptation to, the new BLSE. This paper reports on the study, discusses the major contributors to negative resistance and proposes points for consideration, when transitioning from a TSLE to a BLSE.

Keywords: Architectural education, blended studio learning environments, resistance, adaptation

1 INTRODUCTION

Since the architectural design studio learning environment was first established in the early 19th century at the École des Beaux-Arts in Paris, there has been a complete transformation in how the discipline of architecture is practiced and how students of architecture acquire information. Mobile digital technologies allow students to access information instantly and learning is no longer confined to the rigid boundaries of a physical campus environment. In many schools of architecture in Australia, the physical design studio learning environments however, remain largely unchanged. Many learning environments could be mistaken for those last refurbished 30 years ago, being devoid of any significant technological intervention. While some teaching staff are eagerly embracing new digital technologies and attempting to modify their pedagogical approaches, the physical design studio learning environment is resistant to such efforts.

2 REVIEW OF BACKGROUND LITERATURE

2.1 Physical Environments

The most successful new university buildings are those that allow students to take responsibility for managing and supervising their own learning environments; and in addition to this, where they can help to reinforce the learning of their peers [1]. These environments should be flexible, technologically rich, open 24/7 and with a sufficient occupation capacity to allow different disciplines to connect - in essence, a fusion between a library and a common room. A modified spatial arrangement can assist to break down the pedagogical barriers which exist between students and teachers, and allows students to immerse themselves within their academic environment, rather than only being *consumers*

of dispensed knowledge [1] [2]. Given that what students learn is embedded in the context and environment of how they learn, the modes of delivery and presentation that teachers provide them with, has a major impact on their ability to learn [3]. The theory of situated learning is supportive of a constructivist theory in that the context of the learning activity is a vital ingredient in the learning experience [4]. What a student comes to know is related to how they come to know, which is linked to the environment in which they are actively engaged. This relationship between what and how has been explored by Laurillard and McAndrew [3], Merrill [5] and Scott [6], who relate this to conceptual knowledge and procedural knowledge. These two cannot be separated and a significant aspect of the situation of learning will be the mode of delivery. In selecting an appropriate mode of delivery, consideration should be given to facilitating the appropriate *activities* and constructing the appropriate *situations* in which a student may construct their understanding. Constructive alignment of activity, situation and mode (along with learning objectives and assessment) supports deep learning [7]. Biggs' work on constructive alignment [8] [9] shows that student activity is important in achieving desirable learning outcomes. It follows that aligning the mode of delivery with the learning outcomes is vital.

What is needed are 'opportunities for students to engage in active processing and questioning of ideas, and practice thinking skills' [10]; the kind of thinking that leads to learning [11]. Posner argues that the aim of a learning environment is that students will 'actively construct ideas and generate meaning from sensory input by interpreting the input on the basis of previous experience' [10]. Such sensory input will best come through a range of modes of delivery that would ideally engage with as many senses as possible, not just sight. Such active learning does not, however, come without risks. Hativa [12] notes that while some methods and modes may build a 'community of learners', others may, if not well managed, induce chaos. Such risks are, however, likely to be outweighed by the increased potential of Internet modes like this, to encourage networked learning [13] and constructive learning [14]. Flexible spaces are used with innovation to encompass both physical and virtual learning environments [2] [15] [16], and include a wide scope of spaces where learning takes place: formal and informal spaces, specialised and general spaces, the library, social and eating spaces, and the physical and virtual spaces [1]. Chiddick has described the concept of learning landscapes as a 'silent revolution in education' [17], which will have a demonstrative effect on the way we live, work and play. He further asserts that performance (for example, in a traditional lecture theatre environment) will continue to remain an important pedagogical approach. Over the past decade, the influx of new and affordable technologies, combined with students' desire for collaborative and immersive learning environments and pressures on academics to engage with more interdisciplinary research, have been major drivers for investigating new approaches to the design of learning landscapes. Dugdale believes that learning is as likely to occur in virtual space, as it is in physical space [18]. The generation of online and virtual e-Learning environments to augment traditional face-to-face environments challenges the significance of the on-campus student learning experience [19].

2.2 Blended Environments

While computers and cyberspace are controlled environments, and as such allow greater levels of student-led active collaboration in creating meaning [14], they also require greater levels of self-motivation and autonomy [20], and are therefore not suited to all students, for all activities. There are also recognisable limitations of both synchronous and asynchronous communication, prompting Mason [14] to promote flexibility and pansynchronous delivery modes. On-line learning does engage well with multimedia and this mix of text, image and audio can 'provide enormous enrichment to the methodology of teaching, learning and learning by doing [21]. It cannot yet, however, provide a tactile learning experience as a form of intrinsic feedback [4] such as can be experienced in laboratory or workshop modes of delivery [14]. Considering the emerging phenomena of interactive web 2.0 tools and on-line social media now available, Behling and Klingner [22] seek to understand which of these tools could be successfully incorporated into the classroom, and what this technology will allow educators and students to achieve in the future. They explore the pedagogical approaches that support the blending of new technologies with traditional face-to-face learning. A key issue is teaching students to be critical thinkers and evaluators of information found in an online environment. While most students of today do have computer and technological skills, many of them do not have the ability to apply these skills for deeper thinking and learning. The careful selection and use of web 2.0 tools such as social networking sites, YouTube and course management systems, where matched appropriately to course content, can allow students and educators to balance professional standards, accreditation requirements and mandated learning landscapes [22].

Blended learning effectively engages students with their learning, by providing them with highly interactive learning experiences [23]. If educators take advantage of the online skills that most

students already have, they can develop blended learning techniques to engage students with active participation, interaction and deeper learning [22]. Inclusive educators therefore need to be adept at amalgamating their discipline expertise with suitable applied interactive technologies, within which students can learn to confidently interact within a user-generated context. Not only does the integration of technological tools into the classroom serve to motivate and engage students, it also helps to develop information literacy, critical thinking and communication skills [22]; all key factors for professional and personal success. Students of today are largely dependent on using technology to communicate, socialise and access information [22]. Cultural Anthropologist Wesch researches the effects and significance of new social media and digital technology on global society and culture. His YouTube video, 'A Vision of Students Today' [24], illustrates the divide between how today's *digital natives* read and communicate outside the classroom and how educators expect them to learn within the classroom [25]. Digital natives or the *Net/Digital generation* are defined as the generation born roughly between 1980-1994 and who have lived their lives immersed in and using technology, including computers, mobile phones, digital games, music players and cameras [26] [27]. Howe and Strauss have labeled this generation as the *millennials* and positively define them as optimistic, team-orientated achievers who are skillful with technology - the next *great generation* [28].

2.3 The University Context and Compatibility with Blended Environments

There are fundamental questions about whether education is currently equipped to meet the needs of the next generation of students. Prensky reiterates this by asserting that: "*Our students have changed radically. Today's students are no longer the people our educational system was designed to teach"* (emphasis in original) [27]. The situation is exacerbated by the fact that many educators are *digital immigrants* [27], having had grown up with little or no technology, and often unable or reluctant to incorporate emerging digital technologies into their classroom instruction. *Digital immigrant* educators either speak an out-dated language (from the pre-digital age), or if they do manage to adapt to their new environment, they usually retain some *accent*, that is, their foot in the past. This can be a major inhibitor, when attempting to teach a population that speaks an entirely new language [27].

Bennett et al. argue that while digital natives are held to be active experiential learners who are skilled in multitasking but reliant on technology for retrieving information and interacting with each other [28], there is limited empirical evidence to support this. They identified early research on the differences between these learners which relates to their socio-economic status, cultural/ethnic background, gender and the discipline within which they are learning [28], however this has not been examined in detail. Further research also needs to be undertaken on the relationships between accessibility, use and skill of technology and the attitudinal characteristics used to describe the digital native generation [28]. Hence, while the current research does suggest that many students are technologically proficient, there are students who do not share these skills or levels of access, exposing the fact that the potential impact of socio-economic and cultural factors may be neglected [28]. In order to be effective, teachers of today need to consider both methodology and context. Firstly methodology: Teachers have to learn to communicate in the language and style of their students, less step-by-step, but going faster, more in parallel and with more random access [27]. Secondly content: This should ideally be a fusion of *legacy content* (traditional curriculum) and *future content* (digital and technological) [27]. Teaching both legacy and future content in the language of digital natives, will therefore require a complete overhaul of traditional teaching approach and curriculum content.

2.4 Implications for Architectural Education

Architectural education has a long history, not surprisingly as long as the profession itself. That education has developed from a history of an apprenticeship model of education. It is indeed still a requirement in most countries that a student or recent graduate (the apprentice) be employed by a practicing architect (the master) for a period of two years before being eligible to become a registered architect. This historic relationship of student and teacher bears heavily on the way in which contemporary architectural education has developed. In particular the *studio* or the *atelier* is still the dominant mode of delivery, and within contemporary universities, can be considered to be somewhat of a *unique* learning environment [29] [30]. The design studio has always been, and is likely to continue being, the cornerstone of architectural education [31] [32] [33]. Key properties for the architectural design studio include project-based pedagogy, rapid iteration of design solutions within set constraints, the critique, consideration of precedent, and the importance of visual presentation [34]. The face-to-face desk critique allows the student to discuss their design progress on a regular and informal basis with their teacher, thus acquiring design skills and knowledge through this process [35]

[36] [37]. The studio has developed historically as a *learning-by-doing* environment, where the teacher mentors their students in the design process, and students are challenged to observe design processes - their own, and those of their colleagues and teachers [38].

Much of the activity of the studio centres on dialogue between student and teacher, creating a conversational framework of feedback on concepts and activities [4]. However, the nature of the learning context, the project, makes it quite difficult to set tasks that offer a good level of intrinsic feedback; since the nature of the task is to develop something new and original, for which there is no *correct* answer. Feedback on design projects is nearly always extrinsic, as an external comment on the task [4], and as such this mode of delivery lacks intrinsic feedback. Recent research, which examines the relationships between digital media, design practices and education, has been conducted within an architectural design e-studio, where students were taught to think and design using digital design as the only design medium [39]. It revealed that not only were there changes in the design process and the pedagogical approach, but the final design outcome differed too, thus challenging traditional understandings of design studio pedagogy.

3 METHODOLOGY

3.1 Context

In late 2010, a new digital learning laboratory was purpose designed for the case-study users, at a large university in Australia. It adapted Student-Centred Active Learning Environment for Undergraduate Programs (SCALE-UP) principles, and was built as part of a larger university research project as a trial for a new Science and Technology Precinct and Community Hub (STP-CH). The space layout and arrangement consisted of six distinct *group work zones*, an *open central space*, a *media equipped lecture podium* and a *laptop garage* (containing 10 *laptops*; six *USB document cameras;* and two *mobile teaching headsets*). Each group work zone included two *mobile tables*; nine *mobile chairs*; a *large mobile computer*; and each of these zones were orientated to the outside wall of the space. In addition to general internet access, the new facility was embedded with the following IT/software to provide scaffolding to the collaborative learning environment: *Skype* (free web application for video calling and instant messaging, with mobile integration for iPhone/android devices); *Advanced Video Conferencing* (EVO*)* (advanced videoconferencing tool that allows users to conduct online meetings with up to 16 participants); *Net Support School* (class-room management application, which allows users to centrally control all the class computers); *Open Web Lecture* (OWL) (web-based student response system to engage students in interactive activities whilst in the classroom using web enabled mobile devices); *Google Docs and Mindmeister* (free web applications for collaborative 'real time' creation, editing and sharing of documents/mind-maps using web enabled devices); and *Facebook and Twitter* (free web social utilities that connect people with others around them).

3.2 Data Collection and Analysis

In the first semester of 2011, 165 second year architecture students were separated into two different design studios; 70% of students were allocated to a traditional design studio environment (TSLE) and 30% to the new prototype digital learning laboratory, which was to be used as a blended studio learning environment (BSLE) by design students. The architecture students attended the same lectures, followed the same studio curriculum and completed the same pieces of assessment; the only major differences were the teaching support staff and physical environment within which the studios were conducted. At the end of the semester, the staff and students were asked to complete a questionnaire about their experiences and preferences within the two respective learning environments. The questionnaire response rate represented the opinions of 100% of the 10 teaching staff and over 70% of the students. Following this, the teaching staff and students were invited to participate in focus groups, where a synergistic approach was effected, to allow participants to clarify or expand upon their experiences of teaching and learning architectural design, within the traditional and/or new experimental settings. Using a dual method qualitative approach, the questionnaire and survey data were coded and extrapolated using both thematic analysis and grounded theory methodology. The results from these two different approaches were compared, contrasted and finally merged, to reveal six distinct emerging themes, which were instrumental in offering resistance or influencing adaptation to (where adaptation creates a sense of person-environment fit), the new BSLE. These themes respond to the resistance by highlighting the adaptive notions of *proficiency*, *support* and *compatibility* and extending previous research using similar labeling of thematic outcomes [40].

4 FINDINGS

4.1 Technical/technological *proficiency*

IT proficiency: To make the best use of a BSLE, users require IT and equipment proficiency, or at the very least a desire to learn and experiment, where formal training is not provided. High frustration levels were experienced by teachers who refused or were unable to engage with the technology, but instead continued traditional teaching approaches; 'I wanted all my students to start printing out their drawings on day one …I like to have everything pinned up, so that as a group we can discuss it and they can share …but here, there's nowhere to actually do that' (2.17). Teachers who were prepared to experiment found ways of overcoming the 'restrictions' of the BSLE: 'I would ...tilt the tables up to provide additional wall space and then I would also put them between the two groups …we would get additional wall space and a bit of division in the room (2.20). One of the lecturers noted that: 'the risk is higher going back than going forward …an academic who hasn't changed in 30 years risks nothing coming to a room like this because they don't have to turn the computers on …for someone who is highly integrated with the technology and has changed their course, the risk is much more going back the other way' (1.40). Many students took advantage of open-source cloud-based software/social media, which allowed them to work collaboratively inside the BSLE, and to continue to work together collaboratively once they left the BSLE; due to the intuitive way this software is constructed, it does not require extensive end-user IT knowledge or technological proficiently, which aids in it's success.

Equipment proficiency: The BSLE contained many new pieces of equipment that many of the teachers had never seen or used before. Teachers received minimal training on how to use it, and this was evident in the focus group discussions. The highest frustration levels were experienced by teachers who did not engage with the new equipment, whilst those who demonstrated a desire to learn and experiment, were more successful. One of the teachers said: 'we wanted to learn how to really use these (mobile computers) …because we wanted to show particular resources, show them how to get to things through the library …to do that, we had to spend half an hour fumbling our way through the system, going trial and error, to try and get it working …it was really fumbling around the dark' (2.34). Another teacher confirmed this: '(we) had to use (our) own initiative, to turn up early before class to start to hit buttons and see what happens …you need a (teacher) that's not necessarily all that scared of technology and wants to play around' (2.74). Proficiency with using even more basic equipment seemed to be a problem with some teachers: 'there's a digital whiteboard in this room …I have no idea how to use it …we have had no training on how to use it …we have to figure out how to use it' (2.08); and 'there's movable whiteboards …they have been in here all year …I found out that they were actually movable whiteboards in the second last week of semester one …you know, it would have been nice; we would have used it …I just thought it was decoration' (2.11). The student questionnaire data revealed that over half the students did not feel confident using the technology, although this was not evident during the classes; notwithstanding this, the overwhelming majority of students believed that the equipment was well utilised in the BSLE.

4.2 Technological infrastructure *support*

Adequacy of IT/equipment and software: The BSLE was purpose designed as a generic digital learning laboratory for a new STP-CH facility. During the design briefing stage, each of the users produced a 'wish-list' of desirable IT/equipment and software. Not all requirements could be satisfied due to the diverse range of case-study users participating in the trial. Adequacy of the IT/equipment and software provided in the room was crucial to the success of how classes ran, and as such, each week identified components would be modified, based on the feedback from the users. A significant issue contributing to the frustration of the BSLE participants was a lack of pin-boards to allow students to pin up their work for regular design presentations and critiques. Pin-boards were not required by any other users of the space, therefore mobile document cameras were introduced instead, as they could be used for many other pedagogical activities too. The document cameras, while not a replacement for traditional pin-boards, did allow for innovation by the teaching staff: 'I had one table, two mobile computers and a document camera sitting on the table …while (students) were presenting their conceptual ideas up on (one computer) screen …(they had) their sketches on the document camera …and they had their main (drawing) panel (and physical 3D model) on the desk, leaning up against a wall' (2.66). While a technological solution was realised, it still limited the way students presented their work and how it was subsequently critiqued. Reliance on technology resulted in presentations of a predetermined and structured linear sequence of material. This differs from a more traditional exhibition approach, where all work in pinned up, and can thus be presented in a more organic format. The BSLE housed a secure 'laptop garage', to allow students without laptops to

borrow one for the duration of the class. As opposed to the large mobile computers that are great for group-work, laptops are more personal and suited to individual work and it was important that the space allowed access to both. Because of the laptop configurations, students were unable to 'log-in' if the previous user had not 'logged-out' of the laptop, but instead, had locked it. Out of this seemingly simple problem, frustrations grew and students claimed that 'the laptops wouldn't work; couldn't access the wireless… (and) the laptops would turn themselves off for no reason' (2.5).

4.3 Human infrastructure *support*

IT support: The frustration associated with a perceived lack of IT and environment/facilities support was commonly shared between teachers and students, alike. Teachers felt responsible for 'checking every day that all the batteries (were) in place; all the equipment (was) working; the room (was) set up' (2.12). The additional time spent attending to these activities, was further exacerbated by the already limited face-to-face teaching time and high teacher:student ratios. The teachers agreed that 'there should be an IT person in the room and someone to manage it' (2.27). Frustration levels were mirrored by students, with one student saying: 'it severely affected what we could achieve and get done in class time …a lot of people would just give up, "Screw it, I will do it at home. I cannot work in this space"' (3.12). When technology failed or was perceived to have failed, students seemed resistant to returning to a traditional approach. As student frustration levels rose during the semester, it became evident that some students were contributing to the perceived problems by mischievously swapping wireless keyboards and mice between each of the mobile computers. Instead of checking to see whether the correct peripherals were in place, teachers and students would instantly dismiss the computer as being broken: 'they hardly ever worked' (3.22).

Environment/facilities support: The need to constantly have to set up the room resulted primarily from the ease of flexibility that the BSLE provided, but also from the fact that a wide range of different classes with differing student numbers and pedagogical approaches, were using the room. Having a large percentage of the furniture, fittings and equipment mobile, meant that a significant portion of the beginning of each class (15-20 minutes) would be spent rearranging these to suit the pedagogical approach of the ensuing class. One of the teachers said that he: 'will have moved all the tables around so that everyone fits …gotten the tables from the extra rooms …when the students get here, it is not a mess; it's set up and we can start' (2.37), however he went on to note that: 'we have been paid to do an hour and a half's work and we are doing two' (2.38). Another issue was that access to the BSLE was protected by 24-hour swipe card access, due to the significant monetary value of the mobile technologies embedded within the space. At the beginning of the semester, many staff and students were unable to access the BSLE, as their identity cards had not been activated. While this is a small and easily resolvable issue, it did add to the frustration and negativity of some of the users.

4.4 Pedagogy/technology *compatibility*

Suitability of technology: A series of principles were developed from the data, to describe which technologies were suitable for design studio teaching and learning, and which were barely of use. Interestingly, the main technologies used (three quarters of the class) were those provided by the students themselves; *laptops/iPads/tablets* and *mobile phones*. In addition to this the mobile computers ranked highly. Use of the *laptop garage* was not considerable, but it was enough to determine that there is still a need to provide laptops to students who do not have them. The technology least valued was the *whiteboards* and the *smart screens* did not feature at all. Regarding the mobile computers, one of the teachers said: 'these should be throughout all of the studio spaces …last semester I divided the class up into different groups and they each had to do research a particular thing …they had the tool in front of them as a group …rather than having to look at a laptop' (2.45). Another teacher said: 'it was more exciting for the students to be able to take on more of a multimedia role, as opposed to traditional hand-sketching' (2.49). When asked about how the BSLE supported the teaching of design, one of the teachers responded: 'no matter how much you try to engage with technology, there's still a lot of large-scale drawings and a lot of thinking with pencil (and there can not be) enough table space' (2.15). There was a general agreement between the teachers that the suitability and use of the technology was dependent on the content being delivered and that in general, the room was more suited to teaching theory based subjects, than design.

4.5 Pedagogy/technology/environmental *compatibility*

Design of the blended learning environment: The design of the physical environment and embedded technology supported some design studio activities, but it was not successful for all. It was most

successful for self directed and collaborative group work: ‘the furniture allowed (the students) to sit in a group …and the (mobile computer) became their *campfire* …as a facilitator, instead of being out the front and being the central focus, there (was) no focus on me’ (1.04). ‘In every other room I have had to pick a pen ...but I have never had to do that in this (room) because everything is just "have a chat" or "have a look on here" or get the students to log on and they drive the whole thing’ (1.05). One teacher noted: ‘I would never have conceived having these (mobile computers) in a tutorial room and now they are here …it’s very difficult to conceive going back’ (1.17). Teachers reported increased student attendance, participation, performance and learning; all key indicators for student engagement [37]. Teachers were encouraged by the interaction that the environment supported, allowing direct and instant access to information; this had an impact the success of some of the design studio activities: ‘this room assists us in encouraging them to find out for themselves’ (2.55). Some students, however, firmly believed that learning design in this environment was ‘difficult,’ ‘frustrating,’ ‘off-putting’ and ‘challenging’ (3.31), and that it worked a lot more successfully for theory based subjects: ‘the desks are set up in a way that the groups are the right size ...that you don't feel too far away from people ...you can have a discussion ...it's very easy to see the tutors, to hear them and the work that is required of us does not take up the room necessary that a design subject needs’ (3.31).

Hierarchical social arrangements: The design of the BSLE and the limited amount of technology, created particular social arrangements that were hierarchical and thus a competition for technology. Students who were keen to engage with the technology would turn up early for class, sit down adjacent to a mobile computer (located on the peripheries of the room) and take physical possession of the mouse and keyboard. Students who were less interested or who had their own laptops or tablets, would migrate to the middle of the room, avoiding sitting with those who really wanted to use the mobile computers. Every week the same students would usually follow the same patterns, and the others did not challenge students who really wanted access to the mobile computers. This was an interesting by-product of the research, and a potential area for further research.

4.6 Pedagogy/environmental *compatibility*

Relationships between amenity and learning: Emerging data about the TSLE indicated that amenity, or lack or amenity, discourages designing/learning about design: ‘I wasn't capable of performing …the space was rubbish …I would just do it at home …I had no motivation to do anything there, except for talk and get feedback’ (3.28). Lack of cleanliness, past project work not removed from the studios and a general lack of respect for the space were all cited as reasons for disengaging with learning, in the TSLE. In addition to this, the actual size of the learning environment had an impact: ‘(the TSLE’s) are too big for such small tutorials …so maybe if they put up a wall, halved the room size, maybe that would improve it’ (3.44). This was in contrast with the BSLE, which is more ordered, looked after and while maybe not entirely suitable for design, it does encourage learning albeit other types of content: ‘it is (like) a commercial office, whereas (the TSLE) is more like …a workshop, where you can put your overalls on and hammer away’ (3.38). Students felt more valued when technology was provided, as there was a perception that technology is expensive, and this equates to value.

Significance of furniture: Numerous data concerned the importance of mobile furniture, which allows flexibility within the classroom. There was a consensus that the ability to rearrange furniture within the space was empowering to both teachers and students and a key pedagogical support; while immovable furniture lead to segregation: ‘the way the desks are set up, they are so separated …when you don't know anyone and you are coming into a group of people who all know each other, the room made it really difficult to interact with other people …to form friendships/meet them …you would feel really neglected and you wouldn't feel like you are part of the tutorial …I found that I didn't learn as much as I wanted to or engaged as much as I wanted to, in (the TSLS’s)’ (3.19). If mobile furniture is provided, the physical space needs to be large enough to accommodate this, with sufficient surrounding circulation space. Another important factor was the amount of layout desk space provided for each student: ‘(we) want to participate in group work …however, we also want to have that individual space where we can spread out …there needs to be a desk to yourself but near the other students …that way you can engage in conversation, you can share work easily’ (3.16). Further to this, the height of furniture was also brought up: ‘I feel so much more comfortable and (like I am) in a studio, if I am higher up rather than sitting down low …I feel more inclined to design …whereas if it is low, more like a classroom desk, I just don't feel that I want to stay there to design …I just don't feel like I am in a proper design environment’ (3.17). Finally, the quantity of pieces of furniture was also brought up as an issue. When there is too much furniture, the space becomes disjointed: ‘you have students separated, sitting on their own, when it's meant to be a group activity or discussion’ (3.13).

Impacts of cultural conditioning: It was evident that cultural conditioning had an impact on adaptation to the new BSLE. There were two noteworthy factors of cultural conditioning, which emerged from the data; *noise* and *pin-up space*. Issues of noise due to large student numbers and exacerbated by poor acoustics, were significant: there were 'too many people in the one room …there were three tutors (and 60 students) that started in here and then one (tutor and 20 students) had to leave because there was just too much noise' (3.15) and 'all the glass and the space …it's not suited' (2.04). It appeared that these students had been culturally conditioned to believe that learning could only happen in a quiet space. Lack of pin-up space was also cited as a significant issue, even though the technology provided in the new BSLE allowed for the presentation of work, albeit in an alternative format. This issue in particular, was perpetuated by some of the teaching staff, who were less willing to experiment with the technology and try new approaches.

5 CONCLUSION

Through this study, six distinct themes that were instrumental in offering resistance or influencing adaptation to, new BSLE's, have been identified. In response to each of these themes, the following points for consideration when transitioning from a TSLE to a BSLE, are proposed:

Technical/technological proficiency: Instruction in the use of the IT and equipment supplied within a BSLE is essential for teachers; teachers can then pass their knowledge onto students. It should not be assumed that all teachers have the skills required or are prepared or able to experiment and learn, particularly when face-to-face teaching time is so limited.

Technological infrastructure support: The provision of IT/equipment and software can provide limitations when there is a large range of different users sharing the same facilities. As such, it might be more successful to provide faculty or discipline specific BSLE's, rather than attempting to satisfy all users with a more generic whole of campus, approach. The provision of IT/equipment alone is not sufficient, but the manner in which it is set up and regularly maintained, is crucial to its success, too.

Human infrastructure support: Institutions should consider appointing a dedicated person to support the IT and environment/facilities needs of BSLE's. Relying on teaching staff or students for this, results in unnecessary frustration and negatively impacts on face-to-face class time.

Pedagogy/technology compatibility: If design is taught in a BSLE, it is important that there is not a reliance on digital technologies, for teaching and learning. Digital technologies support the research, collaboration/ideas-sharing and drafting/presentation stages of the design process, however they can provide limitations too, especially when the users are lacking in skills and competence. An environment with a high reliance on technology may be more suitable to senior students.

Pedagogy/technology/environmental compatibility: While BSLE's support self directed and collaborative group work, they are not necessarily suitable for all components of a design studio. It may be important to retain some elements that support traditional design education, while users adapt to the new environment; for example: pin-up boards, drafting tables, light tables and physical model making equipment. This appears to be of more importance for students in the early stages of their design education. Teaching staff should be aware of hierarchical social arrangements and, if necessary, modify their pedagogical approach to allow for a more inclusive environment.

Pedagogy/environmental compatibility: The relationship between amenity and learning is of significance; the physical size, cleanliness and perceptions of value invested in the space may impact on how a student engages with their learning, while occupying a space. Furniture too is worth considering; flexibility and appropriateness of furniture provided to support the learning task are of importance, and in addition to this, consideration should be given to the amount of furniture provided. Cultural conditioning is another issue to consider when adapting to a new BSLE. The influence that teaching staff have on students with respect to this factor, is worth considering.

While the results are not entirely conclusive and many of the causes remain unclear, this initial work provides the grounds for further research in each of these six areas, to make a full assessment or evaluation of the dichotomy of adaptation to new BSLE's for design education. Models for adaptation (for example evolutionary, change management etc.) to new environments have not been investigated within this study, but a review of these would be of benefit to future research in this area.

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